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INSTRUMENT INSTRUCTIONS

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Model DM

SENSITIVE RESEARCH
INSTRUMENT CORPORATION
NEW ROCHELLE, N.Y.

Symbol of Quality

ELECTRICAL INSTRUMENTS OF PRECISION SINCE 1927

Instrument No. 803758/9

INSTRUCTION MANUAL

FOR

OPERATING AND MAINTENANCE

OF

SINGLE PHASE WATTMETERS

MODEL DW

TYPE Shielded Dynamometer

ACCURACY .25%

SCALE LENGTH 6.3"

SENSITIVE RESEARCH
INSTRUMENT CORPORATION
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ELECTRICAL INSTRUMENTS OF PRECISION SINCE 1927

THE MEASUREMENT OF POWER

ON D.C. AND A.C.

USING DYNAMOMETER WATTMETERS

The "Electrodynamometer"is widely used for measuring D.C. and A.C. current and voltage. But it is also equally well adapted for the measurement of electrical power.

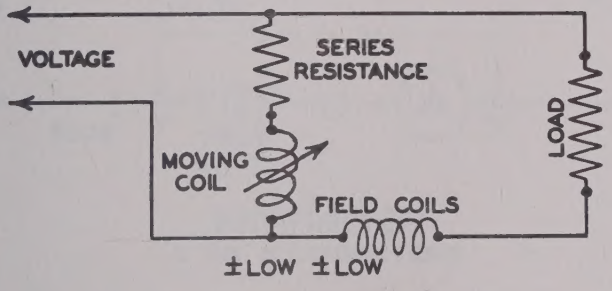
Power can be measured in a D.C. circuit by measuring the voltage applied and the current flowing through, then P = E x I or Power equals Volts x Amperes.

In A.C. circuits it is POSSIBLE that the applied voltage and the current flowing will NOT BE IN PHASE which means that they do not reach their maximum values at the same instant of time.

The available power will not then be VOLTS times AMPERES but VOLTS times AMPERES times the COSINE of the angle between the voltage and current.

These factors require an instrument that will take them into consideration which is very effectively accomplished by the "dynamometer" when used on a wattmeter.

The circuit below shows the connections when using the dynamometer as a wattmeter.



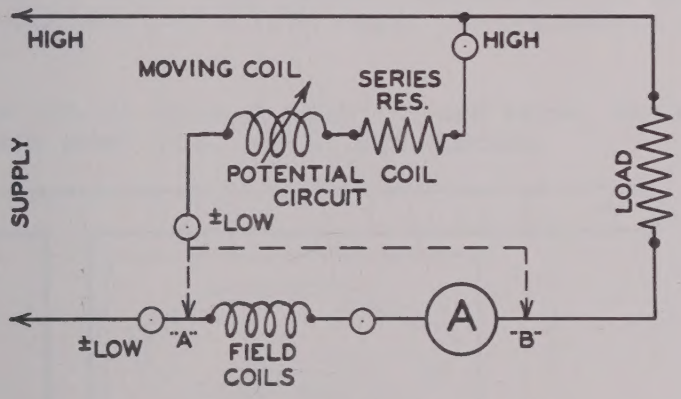
FUNDAMENTAL CIRCUIT

The deflection torque varies with any changes in the field current or potential (moving coil and series resistance) circuit and the torque for any particular instance of time is proportional to the instantaneous product of the field current and applied voltage.

Therefore, a dynamometer when properly connected will indicate the real power of the circuit being measured or that power which is the product of the voltage and that PART of the current flowing which is IN PHASE with the applied voltage.

In many cases, the current in an A.C. circuit does not reach its maximum at the same instant that the voltage reaches its maximum. If its load is inductive the current lags behind the voltage, if capacitive, the current maximum LEADS the voltage maximum.

The size of a wattmeter CANNOT be chosen solely by the number of watts to be measured. It must be fixed by the current and voltage of the circuit, irrespective of power, since the wattmeter coils will only stand a certain current before burning out. If the power factor is low, the watts will be low, despite the high volts and amperes. The only solution is to use a sensitive wattmeter DESIGNED for low power factor work. Such a wattmeter has a watt rating which is but a fraction of its volt-ampere rating. All SENSITIVE RESEARCH WATTMETERS can be used down to 50% and some special instruments to as low as 5% power factor. This means the use of heavy wire (and few turns) in the current circuit, with a resultant loss of torque, and calls for a high degree of engineering and craftsmanship in the design and construction of such instruments.



WATTMETER
"A" OR "B" CONNECTIONS

Another obvious point which is all too often overlooked is shown in Figure 3 above. This shows the ONLY TWO possible connections of the moving coil or potential circuit in a single phase wattmeter. It can be seen from the circuit that with the potential circuit connected to the load side of the field coil, (Connection B) the current being drawn to actuate the moving coil, is added to the load current and it is BEING MEASURED by the wattmeter. On the other hand, with the potential circuit connected AHEAD of the field coils, the potential being used is greater than actually applied to the load by the amount of the voltage drop in the field coil. However, in either case, the instrument reads HIGH by the power lost in either its own potential or current circuit, NEVER by both.

Each instrument has the potential circuit resistance indicated on the scale and the amount of error from the instrument power can be calculated and allowed for, easily. The connection which gives the LEAST POWER lost in the instrument should, of course, be used.

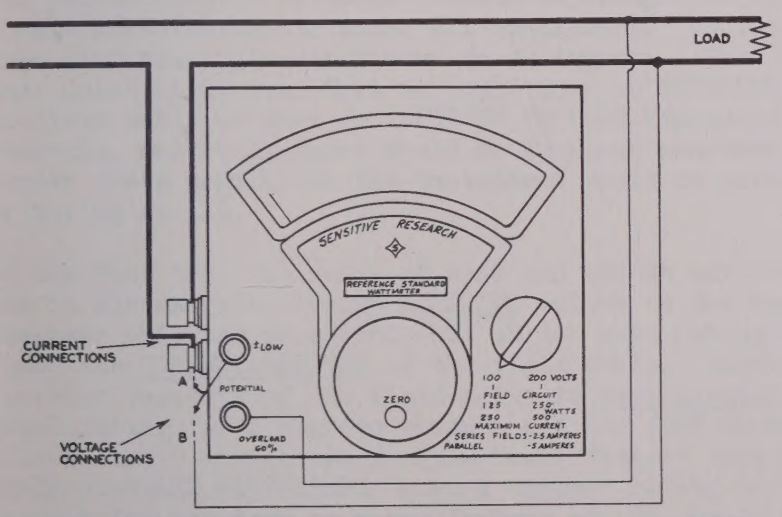
Using the "A" connection:
Actual watts = Wattmeter reading minus - I^2R fields + I^2R Ammeter

Using the "B" connection:
Actual watts = Wattmeter reading minus - $\frac{E^2}{R}$ Potential Circuit

FREQUENCY COMPENSATION

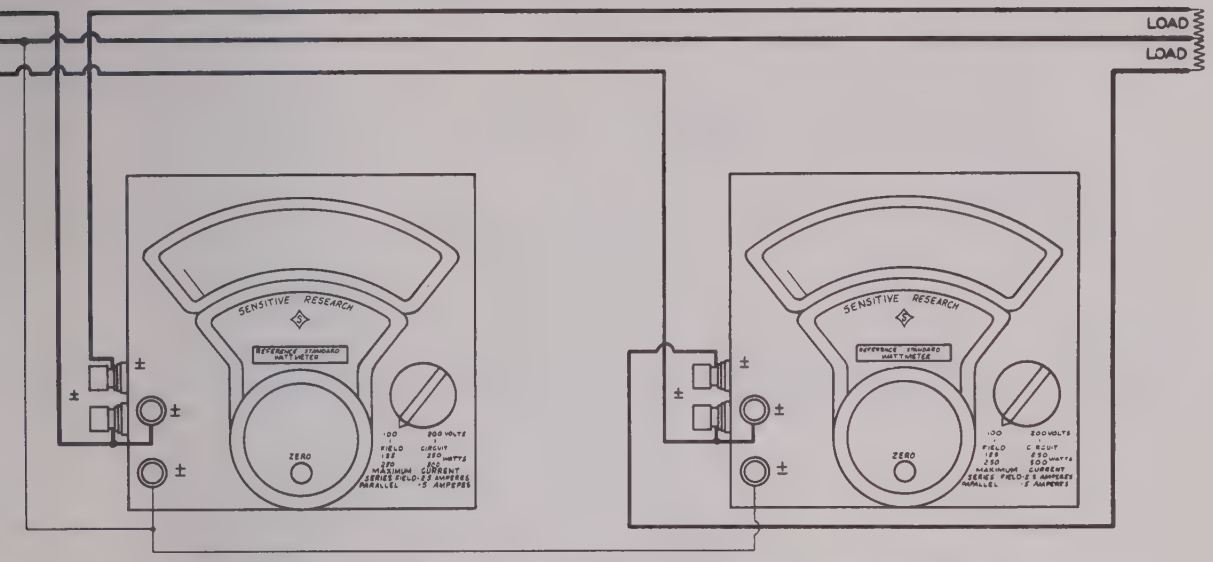
As seen in Figure 2, there could be appreciable inductance (that of the moving coil) in the potential circuit. The instrument could have a phase angle error which would increase with frequency, and this is responsible for the frequency limitation given on the instrument data card. At these listed frequencies the phase angle error will ordinarily be less than one or two minutes, a negligible amount. If the instrument is required for readings at a given higher single frequency they can be compensated for that single frequency up to many times their normal value. They can also, with some greater difficulty be made, under certain limitations, to have a flat frequency characteristic over a wide range. Correspondence solicited.

The wattmeter circuit shown on page ( ) and below, is that used to measure single phase power in a two (2) wire circuit.



CONNECTIONS FOR SINGLE PHASE WATTMETER IN A TWO WIRE CIRCUIT
CONNECT TO A FOR "A" CONNECTION AND TO B FOR "B" CONNECTION
(SEE TEXT)

For power measurement in the usual 3 wire-single phase circuit, two separate wattmeters are required unless a polyphase wattmeter is used. (See POLYPHASE WATTMETER operating instructions.



CIRCUIT DIAGRAM USING TWO WATTMETERS IN A SINGLE PHASE THREE WIRE CIRCUIT

VERY IMPORTANT

We know that Watts = E x I Cosine θ.

Several points about a wattmeter should be brought to mind in order to use a single phase wattmeter under all conditions. In the first place, let us assume that the angle θ advances to 90 degrees. Cosθ then becomes 0 and at that point it is seen that we could draw an INFINITE CURRENT through the field coils or have an INFINITE VOLTAGE impressed across the potential circuit, and still there would be NO power consumed by the load. Obviously, under these conditions the instrument would be burned out without the pointer moving at all.

Due to the fact that the value of cosθ can assume any value from 1 to 0 that makes it necessary to assign LIMITING values to the current capacity of all wattmeters which is dependent, NOT on the watt rating of the instrument, but upon the CURRENT RATINGS of the field coils. Instruments, in which the current capacity of the field coils is much greater than the normal current rating for 0 degrees phase angle (or 100% power factor as it is usually called), are listed as "Low Power Factor" type instruments. Our "REFERENCE STANDARD WATTMETERS" have a current rating of their field coils sufficient for use down to power factors of 50%, while the "LOW POWER FACTOR" instruments can be used down to as low as 20% power factor with no danger of field coil damage. In certain special instruments this has been reduced to 5% P.F.

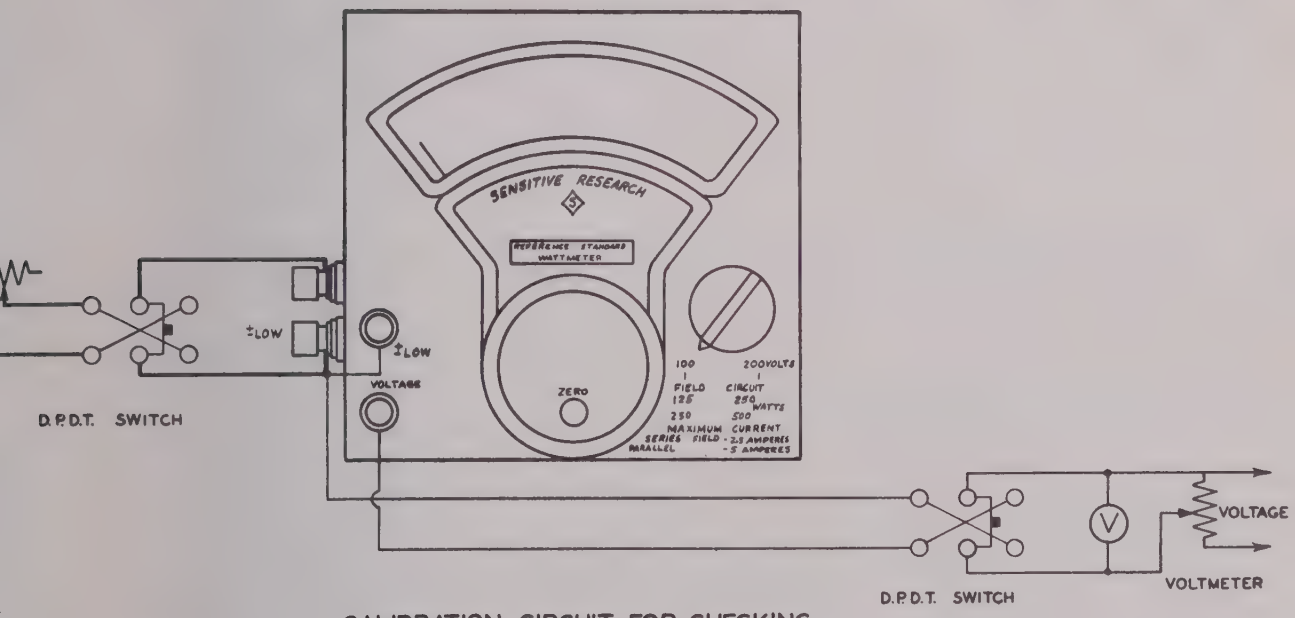
WATTMETER CALIBRATION PROCEDURE

This is readily accomplished on direct current provided accurate standards of voltage and current are obtainable.

A separate source of voltage and that of current are required both of which must be variable in small values.

Use the circuit as shown below.

IMPORTANT: BE SURE to link (connect) the ± low Binding Posts together so as to prevent any electrostatic errors occuring while calibrating.



CALIBRATION CIRCUIT FOR CHECKING SINGLE PHASE WATTMETER ON D.C.

Remembering that P = E x I and assuming a Wattmeter with ranges of, say, 125-250-500 Watts at voltages of 100-200 Volts:

$$I = \frac{P}{E} = \frac{125 \text{ Watts}}{100 \text{ Volts}} = 1.25 \text{ Amperes}$$

This means that if 1.25 amperes is allowed to flow through the field circuit as measured by an ammeter and that if 100 volts is impressed ACROSS the potential circuit, then the wattmeter will read 125 watts. It is considered good instrument practice to apply both the D.C. current and D.C. voltage also in the reverse direction and then take the "MEAN" of both readings as the true scale point for 125 watts. The other scale cardinal points are found in like manner.

It is suggested for ease of calibration that the potential of 100 Volts be maintained and the current varied.

For instance, to obtain the current for the 100 watt point on the 125 watt scale:

$$I = \frac{100 \text{ Watts}}{100 \text{ Volts}} = 1.00 \text{ Ampere}$$

Likewise for,

$$I = \frac{50 \text{ Watts}}{100 \text{ Volts}} = .5 \text{ Ampere}$$

Using the above formula any and all scale cardinal points can be obtained remembering to reverse the D.C. and take the "mean" of the readings.

250 WATT RANGE - Using 100 Volts

To obtain 250 Watts at 100 Volts the fields must be connected by the link system in parallel. (See switch engraving on panel)

$$\text{Then } P = \frac{250 \text{ Watts}}{100 \text{ Volts}} = 2.5 \text{ Amperes or } 1.25 \text{ Amperes through each field.}$$

Using parallel fields with a current of 2.5 amperes and a voltage of 100 volts the instrument will deflect to full scale or 250 watts.

As written above using the formula $I = \frac{\text{Watts}}{\text{Volts}}$ any scale point can be readily duplicated or obtained using 2 (two) separate D.C. sources one for current the other for volts.

250 WATT RANGE - Using 200 Volts

We can also obtain a 250 Watt range calibration by using series connected fields with a current flow of 1.25 Amperes and apply 200 Volts on the potential circuit AFTER moving the range selector switch on the wattmeter panel to its 200 Volt position. (See the engraved instructions on every SENSITIVE RESEARCH Wattmeter panel.)

$$\text{Then } I = \frac{\text{Watts}}{\text{Volts}} = \frac{250 \text{ Watts}}{200 \text{ Volts}} = 1.25 \text{ Amperes}$$

The other scale cardinal points are obtained in the usual manner as explained above.

500 WATT RANGE - Using 200 Volts

We use parallel fields and 200 Volts to obtain the 500 Watt range. Then

$$I = \frac{500 \text{ Watts}}{200 \text{ Volts}} = 2.5 \text{ Amperes}$$

With 2.5 amperes flowing in parallel connected fields with 200 Volts across the potential circuit will cause a full scale deflection or the equivalent of 500 Watts. Be sure to reverse the D.C. current and voltage, take the "mean" of the readings.

GENERAL INFORMATION

Upon receipt, your instrument should be carefully unpacked and examined for any visible external damage, i.e; split case, cracked glass, broken binding posts, etc. Place the instrument on a reasonably level bench. If the instrument has a wire shunting (across) the terminals, it should be removed. With the mechanical zero adjuster thumb knob, move the pointer both above and below the zero line of the scale. It should have sufficient travel to go a little beyond zero in each direction. Set the pointer exactly on zero while lightly tapping the instrument case with your fingers. The pointer will be correctly adjusted for zero when no reflection of the pointer's knife edge can be seen in the anti-parrallax mirror and the pointer is directly over and in line with the scale zero.

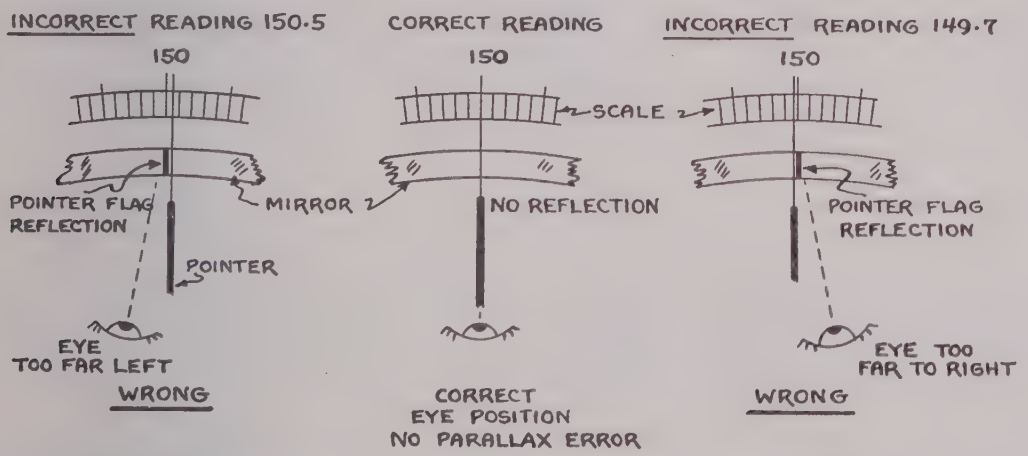


ILLUSTRATION OF THE ANTI-PARALLAX PRINCIPLE

The pointer indication should only be "read" when no reflection of its knife edge can be seen in the mirror below. This is only obtained when the eye is directly over the pointer. The drawings above illustrate the anti-parallax principle.

BALANCE TESTS FOR DIRECT CURRENT INSTRUMENTS

The general testing procedure for balance on all portable and panel instruments is the same, the difference being only in the degree of angle that the instrument is tipped from a horizontal position.

1. See that the pointer is set exactly on its zero position.

2. Now tip the instrument slowly up from the side farthest from you to an angular position as shown on the table below, and tap gently. The pointer should NOT move more than the amount shown on the table below.

3. Next, lay the instrument flat again and then tip it on its side, both left and right, and tap gently.

In both of these procedures, the instrument should be within its balance specifications. In general, these specifications are as follows:

ALTERNATING CURRENT INSTRUMENTS

MODEL	ACCURACY	ANGLE FROM HORIZONTAL	BALANCE GUARANTEE
A (ALL THERMALS)	.75 of 1%	15°	.75 of 1%
MI,D,DW, UNIVERSITY	.5 of 1%	25°	.5 of 1%
D, DLW	.25 of 1%	25°	.25 of 1%
L (LAB. ST'DS	.1 of 1%	10°	.1 of 1%

FRICTION TESTS

The instrument may be tested for mechanical friction at this point, by connecting it to a suitable source of power and deflecting it at least 25% of full scale, then reducing the deflecting current to zero. No instrument should be accepted for use if it has any appreciable friction.

CALIBRATION CHECK

No actual calibration check should be made until the instrument has become thoroughly temperature saturated at ambient room temperatures for at least four hours. (Allowed to reach room temperature.) SENSITIVE RESEARCH calibrates all instruments at exactly 25° C.

Make sure you are on the right range for your power supply. If in doubt set the range switch if any, on the instrument, on its highest range. This will prevent overloading of the instrument when starting any electrical tests. If only a slight pointer deflection results when power is applied, then successively switch the instrument range selector DOWN until a suitable reading is obtained. Bring the pointer up to full scale and open the instrument circuit. A special precaution should be taken by the user of thermocouple instruments, and that is to AVOID opening the primary circuit of a transformer whose secondary circuit is being measured by thermocouple instruments. The reason for this is that the transformer as an energy storing device, may, under certain conditions, DISCHARGE its energy into the secondary circuit, thereby overloading the thermocouple instrument. (Overloads of 1000% are quite possible in transformer circuits.)

This danger can be eliminated by either disconnecting the instrument from the secondary circuit which can be turned to "zero" so that the excitation of any transformer primary may be reduced to "zero" before switching off.

The pointer should return to its original zero without tapping. If it returns to zero only when tapped, it indicates friction in the movement and possible damage to the pivots and jewels, possible through some severe shock in transit. For portable instruments with an overall accuracy of .5 of 1% or higher, and all high torque panel types, the pointer should return to exactly zero. Ultra high sensitivity instruments in the 1% class, and thermocouple instruments in the .75 of 1% class should have a maximum deviation from zero to no more than .1 of 1% of the physical length of the scale.

The pointer should then be deflected using controlled power slowly up and down the instrument scale. The pointer action should be smooth and there should be no sticking or hesitation at any point on the scale. Do not, however, mistake a rough spot in the controls of your power supply for a "stick" in the movement. Often, a badly regulated power supply or a loose circuit connection may make the instrument appear to have an internal variable. All instrument links and leads should be carefully attached and tightened.

The new instrument should be checked against an accurate standard on the cardinal points of the scale. Jus one word of CAUTION. Be careful that you do not place your new instrument and your standard too close together, especially with D.C. instruments. They may react magnetically on each other if your standard instrument is not magnetically shielded, it might indicate incorrect readings. Keep them at least six inches apart. Also, if the instrument was specially ordered for use on a steel panel (such information is printed on all our scales) then test it on a steel panel of the specified thickness.

Of all the things, that may be wrong when you get a new instrument, incorrect calibration is the LEAST likely; and if present at all, it will usually be caused by bad balance which you will already have detected by the test just covered. 99.99% of the instruments you receive, if they are satisfactory for balance, friction, stickiness etc., will also be well within their guaranteed accuracy.

NOTE:

Disassembly of the movement should not be attempted unless a skilled instrument man with calibration and scale drawing equipment are available.

CARE AND MAINTENANCE

All SENSITIVE RESEARCH instruments are individually assembled by skilled instrument makers and are INDIVIDUALLY calibrated. We do not calibrate instruments "en masse". Extreme care has been used in selecting pivots and shock mounted jewel bearings. In some instruments DIAMOND PIVOTS are used.

The instrument should be used and treated as a precision standard. A reasonable amount of care will bring its reward in a lifetime of accurate service.

Good practice dictates that periodic checks be made for pivot friction, coil, balance, scale calibration, and the mechanical integrity of any instrument.

If the instrument glass is cleaned by any method, the task should be completed by heavily breathing upon the glass so as to dissipate any electrostatic charges that may have been generated by friction. Occasionally the binding posts metal contact surfaces should be cleaned and brightened by the careful use of a fine sandpaper. A yearly coat of wax on any wooden instrument case is suggested.

Instrument panels are cleaned by using carbon tetrochloride to dissolve any greasy surface accumulations. A brisk rubbing with a soft flannel cloth will restore our moulded panels to their original lustre. Should the engraving "white" become discolored it can be removed with a sharp point and refilled with a white wax crayon material obtained from us.

OPERATICNAL PROCEDURE

1. Place the instrument on a level surface so that the scale is horizontal. Deviations of more than 5° from the horizontal may affect accuracy adversely.

2. For good instrument practice, the instrument should be kept away from any source of very strong magnetic fields. Maximum tolerable field is 5 oersted.

3. Set the pointer on zero by rotating the zero shifter, using thumb or zero screw. The pointer is correctly set on zero when the reflection of the pointer in the antiparallax mirror coincides with the pointer itself and with the zero line. (See general information sheets.) Page 4

4. For safety it is best to turn off the current or voltage to be measured before making connections to any instrument. Observing proper polarity, connect the instrument terminals in series with the circuit if current is to be measured.

   If voltage is to be measured then the voltmeter is to be in parallel to the portion of the circuit desired. It is important to remember that when an ammeter (current measuring instrument) is inserted in series with a circuit, the circuit is changed by the introduction of the ammeter resistance. Ammeters are therefore designed to be of low resistance so that they will only be a small fraction of the total resistance of a circuit.

   Remember also that when a voltmeter is connected across (in parallel) with a portion of a circuit it changes the potential difference by its own effect on the circuit and since it also is connected in parallel with a part of the circuit it reduces the effective resistance of that portion which increases in some degree the total current flowing in the complete circuit.

   Therefore voltmeters are designed to have the highest resistance possible so as not to change materially any circuit to which they may be applied.

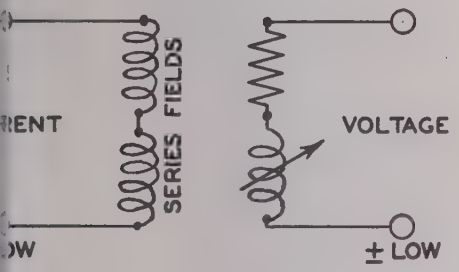
5. It is considered good instrument practice in multirange instruments to have the range switch on the highest possible range and then the user can progressively switch down to the range that produces an acceptable reading. A good acceptable reading would be one in which the pointer is indicating in the upper fifth of the scale. (Nearly maximum deflection.) Apply power and observe pointer deflection. When the instrument pointer has come to rest, the current is indicated by the position of the pointer on the scale.

SPECIFICATIONS & SCHEMATIC DIAGRAMS
OF
SINGLE PHASE WATTMETERS

Portable
DW INSTRUMENT Nº 503758/9
WORD WARAB.
S 125/250/500 WATTS 100/200 V 50% PF
AGRAM Nº 4

SPECIAL FEATURES

(1)



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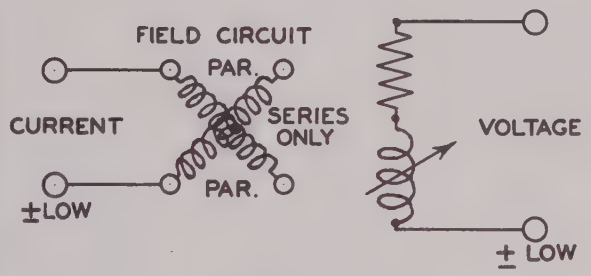

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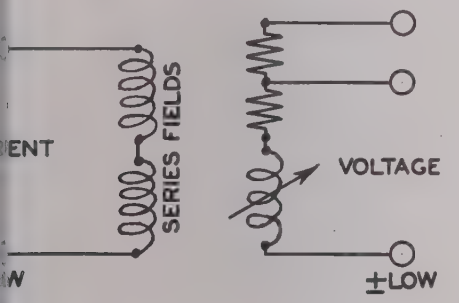

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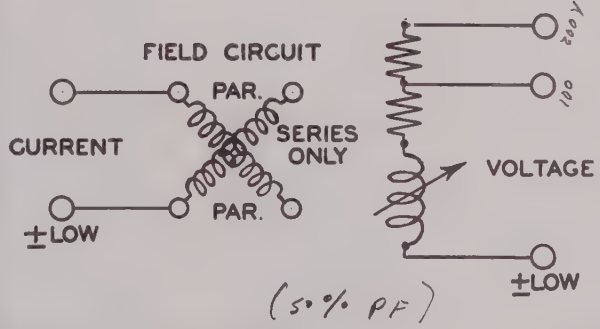
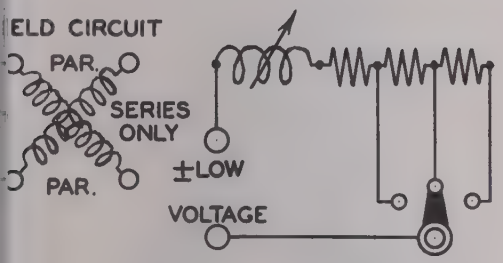


(50% PF)

(5)



(6)

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SRICO BY J. J. Patterson DATE 19/11/57

SPARE PARTS LIST

MODEL | SECTION

CUSTOMER | CONTRACT NUMBER

ITEM NUMBER	PART NUMBER		DESCRIPTION	S.R.I.C. WILL REPAIR	PIECES PER ASSEMBLY	PIECE PRICE
	CUSTOMER PART NO.	S.R.I.C. PART NO.		CUSTOMER CAN REPAIR		
			WOODEN CASE PARTS			
1		SR#1501A	Model DW wooden case with cover, complete		1	$20.00
2		SR#702	Case inserts brass (9/16" - 4/36)		6	.10ea
3		SR#1505	Case hinge 1.1/4" length # 3211		2	.50"
4		Standard	Wood screws for case hinge (#3 - 1/2" flat head)		8	
5		SR#760	Chrome plated brass frame for data card		1	2.00
6		Standard	Acetate film for protection of data card		1	.50
10		Standard	Wood screws for mounting data card frame (1/4" -#2 round head)		5	
11			Wooden case - White rubber feet		4	.25ea
12		SR#7603	Standard leather carrying strap		1	2.50
13		#5534	Leather strap brackets		2	.50ea
14		Standard	Wood screws for strap brackets (3/8" -#6 oval head)		4	
15		SR#1506	Case lock mountings #05921 - 1/2		1	2.00
19		Standard	Wood screws for mounting case lock (3/8" - #2 oval head)		6	
20			Properly engraved identification nameplate for case		1	2.00
21		SR#7701	Rubber gasket for panel		1	2.15
22		Standard	Screws for fixing carcass plate (1" - 10/32 Phillips oval head)		4	
23		61FC	Lock nuts for carcass screws 10/32		4	.20ea

STANDARD - Readily obtainable.

SENSITIVE RESEARCH INSTRUMENT CORP. 310 MAIN STREET, NEW ROCHELLE N.Y., U.S.A.

SPARE PARTS LIST

MODEL SECTION

CUSTOMER CONTRACT NUMBER

ITEM NUMBER	PART NUMBER		DESCRIPTION	S.R.I.C. WILL REPAIR	CUSTOMER CAN REPAIR	PIECES PER ASSEMBLY	PIECE PRICE
	CUSTOMER PART NO.	S.R.I.C. PART NO.					
			WOODEN CASE PARTS (CONTD).				
24		SR#1001	Connection plate			1	$5.00) with) Binding) Post) $12.00)
25		Standard	Mounting screws for connection plate			4	
26		SR#47	Field binding post			4	
27		SR#47	Current circuit binding post			2	

STANDARD - Readily obtainable.

SENSITIVE RESEARCH INSTRUMENT CORP. 310 MAIN STREET, NEW ROCHELLE N.Y., U.S.A.

SPARE PARTS LIST

MODEL SECTION

CUSTOMER CONTRACT NUMBER

ITEM NUMBER	PART NUMBER		DESCRIPTION	S.R.I.C. WILL REPAIR	CUSTOMER CAN REPAIR	PIECES PER ASSEMBLY	PIECE PRICE
	CUSTOMER PART NO.	S.R.I.C. PART NO.					
			INSTRUMENT PANEL PARTS				
1		SR#1501	Molded bakelite panel, Model DW with glass panel - Engraved			1	15.00
2		SR#47	Black #47 binding posts complete with nuts and washers			2	.65ea
3		Standard	Round washers - #10 hole for binding posts			2	.05 "
4		Standard	Star washers - #10 hole for binding posts			2	.05 "
5		Standard	Nuts 10/32 for binding posts			2	.07 "
10		SR#506	Zero cam and pin assembly			1	2.00
11		SR#507	Zero friction washer			1	.20ea
12		SR#508	Zero adjustment thumb nut			1	1.50
13		Standard	Panel mounting screws (1" - 4/36 Phillips oval head)			6	1.00) per set)
14		GL2	Panel glass Model DW			1	1.00
20		SR#7702	Felt gasket for instrument panel glass			1	.50
21		SR#518	Model DW glass clips			4	.10
22		SR#411	Grounding lug for panel electrostatic shield			1	.10
23		Standard	Screws for glass clips (1/8" - 4/36 Fillister head)			4	

STANDARD - Readily obtainable

SENSITIVE RESEARCH INSTRUMENT CORP. 310 MAIN STREET, NEW ROCHELLE N.Y., U.S.A.

SPARE PARTS LIST

MODEL SECTION

CUSTOMER CONTRACT NUMBER

ITEM NUMBER	PART NUMBER		DESCRIPTION	S.R.I.C. WILL REPAIR	CUSTOMER CAN REPAIR	PIECES PER ASSEMBLY	PIECE PRICE
	CUSTOMER PART NO.	S.R.I.C. PART NO.					
			CARCASS PLATE PARTS				
1		SR#201	Molded bakelite carcass plate - Model DW			1	$12.00
2		SR#902	Mirror scale pillars			2	2.50ea
3		SR#901	Heavy mirror plate			1	
4		Standard	Screws for mirror plate (1/4" - 6/32 flat head)			2	
10		SR#602	Model DW flexible mirror			1	3.00
11		SR#405	Model DW instrument blank scale plate			1	2.50
12			Scale spacers			2	
13		Standard	Model DW scale mounting screw (1/4" - 3/48 binding heads)			4	
14		SR#319	Large terminal connection lug			2	.50ea
20		Standard	Fixing screws for large terminal connection lug (3/16" - 2/56)			4	.08ea
21		Standard	Baseplate screw (3/8" - 6/32 Fillister head)			4	
22		Standard	Flat washer #6			4	.10"
23		SR#913	Baseplate support (Tap 6/32 - 5/16"x3/4")			2	2.50"
24		Standard	Flat washer #6			4	.10
25		SR#915	Molded vane chamber			1	12.00

SENSITIVE RESEARCH INSTRUMENT CORP. 310 MAIN STREET, NEW ROCHELLE N.Y., U.S.A.

SPARE PARTS LIST

MODEL SECTION

CUSTOMER CONTRACT NUMBER

ITEM NUMBER	PART NUMBER		DESCRIPTION	S.R.I.C. WILL REPAIR	CUSTOMER CAN REPAIR	PIECES PER ASSEMBLY	PIECE PRICE
	CUSTOMER PART NO.	S.R.I.C. PART NO.					
			CARCASS PLATE PARTS (CONTD)				
26		SR#914	Dynamometer baseplate			1	$7.50
27		SR#912	Vane chamber cover			2	5.00) pair)
28			Screw for vane chamber cover			6	
29			Linen stabilizer block			1	2.50
30			Screw for mounting linen stabilizer block (4/36 oval head)				
35		SR#U-1502	Magnetic shield			1	20.00

STANDARD - Readily available.

SPARE PARTS LIST

MODEL | SECTION

CUSTOMER | CONTRACT NUMBER

ITEM NUMBER	PART NUMBER		DESCRIPTION	S.R.I.C. WILL REPAIR		PIECES PER ASSEMBLY	PIECE PRICE
	CUSTOMER PART NO.	S.R.I.C. PART NO.		CUSTOMER CAN REPAIR			
			SWITCH PARTS FOR MODELS "D" - "DW" & "DLW"				
1		SR#201	Molded bakelite carcass plate with switch			1	$18.70
2		SR#303	Switch shaft 3/16" - 5"			1	1.60
3		SR#304	Switch shaft end disc			1	.50
4		SR#306	Switch brush holder			1	2.30
5		SR#307	Switch brush lower			1	1.00
6		SR#307B	Switch brush middle			1	1.00
10		SR#308	Switch brush upper			1	1.00
11		SR#310	Switch shaft thrust spring			1	.30
12		SR#316	Spring for click ball			1	.25
13		SR#317	Steel click ball			1	.25
14		SR#318	Switch knob			1	1.25
20		SR#320	Felt washer			1	.05
21		SR#322	Friction washer for brush holder			1	.15

SENSITIVE RESEARCH INSTRUMENT CORP. 310 MAIN STREET, NEW ROCHELLE N.Y., U.S.A.

SPARE PARTS LIST

MODEL SECTION

CUSTOMER CONTRACT NUMBER

ITEM NUMBER	PART NUMBER		DESCRIPTION	S.R.I.C. WILL REPAIR / CUSTOMER CAN REPAIR	PIECES PER ASSEMBLY	PIECE PRICE
	CUSTOMER PART NO.	S.R.I.C. PART NO.				
			MOVEMENT PARTS			
1		SR#911	Bridge upright		2	$ 9.00) pair)
2		SR#903	Field clip		2	.20ea
3		SR#921	Dynamometer bridge		2	
4		SR#910	Field connection plate		1	1.00
5		SR#918	Field connection lugs		4	.20ea
10		SR#415	Pointer stop screw (card 3/32" - 80 shoulder screw)		2	.30
11		SR#420	Pointer striker (glass)		2	.20
12			Bottom bridge assembly		1	
13			Top bridge assembly		1	
14		SR#704	Model D Spring mounted jewel - Bottom jewel		1	3.50
15		SR#708	Model D jewel screw, hard jewel - Top jewel		1	2.50
20			Instrument moving coil assembly complete with pointer, pivots, springs and moving coil. Important - When ordering moving coil it is requested that you give the instrument number if possible.			All AC Instruments $28.00

SENSITIVE RESEARCH INSTRUMENT CORP. 310 MAIN STREET, NEW ROCHELLE N.Y., U.S.A.

SPARE PARTS LIST

MODEL SECTION

CUSTOMER CONTRACT NUMBER

ITEM NUMBER	PART NUMBER		DESCRIPTION	S.R.I.C. WILL REPAIR		PIECES PER ASSEMBLY	PIECE PRICE
	CUSTOMER PART NO.	S.R.I.C. PART NO.		CUSTOMER CAN REPAIR			
			MOVEMENT PARTS (CONTD)				
21		DP700	Diamond pivots - optional			2	$15.00ea
22		SR#702	Steel pivots			2	1.00 "
23		SR#U-411	Bridge lug			2	.10 "
24			Field - stationary Important - When ordering stationary field it is requested that you give the instrument number if possible.			2	15.00) pair)

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